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Long-term effects of public early childhood education on academic achievement in Chile

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ABSTRACT

There is an ever-growing emphasis worldwide on increasing access to early childhood care and education programs and generating high-quality educational experiences for children, especially those from low-income families. Chile is not an exception in this global trend. Although Chile has significantly expanded early education coverage for children from low-income backgrounds, there has been little research to assess the effects these programs have had in improving academic outcomes. Responding to this need, this study assesses the impact of Chile's public early childhood education programs on fourth-grade academic achievement (as measured by the country's national Education Quality Measurement System, SIMCE). Our results indicate that, after controlling for socio-demographic factors potentially associated with choosing to participate in an ECCE program or not, ECCE is positively associated with academic gains on all three SIMCE tests: mathematics, reading, and social sciences. Chilean children who participated in public ECCE programs scored on average 0.23 Standard Deviations (*SD*) higher in math, 0.19 *SD* higher in reading, and 0.19 *SD* higher in social sciences than children who did not attend an ECCE program before entering Kindergarten. However, our findings suggest that not all children benefit equally from attending ECCE. Results show that boys benefit academically significantly more than girls, and that the ECCE effect on academic achievement also differs depending on the Socioeconomic Status (SES) of the families, with children from middle-low SES groups benefiting the most.

Introduction

Over the past two decades, research and policy in the field of early childhood education have become increasingly visible due to: (a) advances in neurosciences showing that early childhood is a critical stage for brain development (Shonkoff & Phillips, 2000); (b) studies showing a positive impact of early childhood programs on future development of individuals (Barnett, 1985, 1995, 2008); (c) cost-benefit analysis of early childhood education programs (Belfield, 2006; Heckman, 2000); and (d) the potential impact of early childhood education in reducing educational inequalities (Brooks-Gunn, 2003). These advances have led policymakers around the world to put a stronger emphasis on expanding access to early childhood care and education (ECCE) and, at the same time, improving the quality of these programs, especially for those that target children from low-income families.

Given this increased emphasis on ECCE in policy, evaluating the long-term effects of ECCE programs on academic skills and achievements has become increasingly important. The case for investing public funds in ECCE programs is either strengthened or weakened depending on the degree to which there are developmental gains and these are sustained over time (Magnuson, Ruhm, & Waldfogel, 2007a). Thus, strong evidence can highlight the need to design, redesign, or even withdraw funding from ECCE programs.

A large amount of early childhood education research developed in the United States shows that ECCE fosters academic achievement, at least through elementary school. However, results vary greatly depending on the quality of ECCE programs, as well on how those research studies have been designed (Barnett, 2008; Camilli, Vargas, Ryan, & Barnett, 2010; Nelson, Westhues, & MacLeod, 2003). The most recent meta-analysis on the effects of ECCE programs analyzed 123 studies and found an average effect size on cognitive outcomes that ranged from 0.12 to 0.48 standard deviation units (Camilli et al., 2010). Studies that have found larger long- term effects (when children are assessed five or more years after exiting the ECCE program) have usually been follow-up studies of model programs. Model programs are those that are designed as part of research studies and that undergo evaluations

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under an experimental or quasi-experimental design. These programs shared some characteristics, including that they all targeted children from families with low socioeconomic status (SES) and exhibited high structural quality indicators, such as: small class size, high teacher-to-child ratio, and well-trained and qualified teachers (Barnett, 1995, 2008). The two best-known model programs in the US are the Abecedarian Project and the Perry Preschool study. Follow-up studies of the Abecedarian project found significant achievement differences in both reading and math (as measured by the Woodcock-Johnson tests) for participants in the ECCE program. These positive effects were found for treated individuals tested longitudinally at ages 8, 12, 15, and 21 years, with treatment effect sizes (centered at age 15) that averaged 0.45 *SD* in reading and 0.37 *SD* in math over that time span (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001). Similar findings emerged from Perry Preschool follow-up studies, suggesting that this program also had a positive impact on students' academic outcomes. Results show that at age 14, individuals who participated in the program scored higher in reading and mathematics in the California Achievement Test (CAT) than non participants. The effect sizes ranged between 0.50 *SD* and 0.76 *SD* (Besharov, Germanis, Higney, & Call, 2011). What is more, these follow-up studies showed long-ranging effects, such as increased employment and earnings, decreased welfare dependency, and reduced arrests through the age of 40 (Schweinhart et al., 2005).

Research on these model programs suggests that quality early childhood education can have a long-lasting academic impact on child development. Since these programs were designed and assessed under controlled conditions, they give us the upper bound of what can be achieved and not the results we will expect on programs without controlled conditions in the US or in other countries, such as Chile. For this reason, it would not be wise to use them as main evidence to design large-scale ECCE programs or policies. Nonetheless, these studies provide a valuable frame of reference of what might be possible to achieve under high-quality conditions.

Longitudinal observational studies such as the Early Childhood Longitudinal Study Kindergarten class (ECLS-K) and The Early Child Care Study (National Institute of Child Health and Human Development Network, 2005) have also found positive long-term academic effects for students who attended ECCE programs, although these effects are smaller than those reported in the follow-up studies of model programs (Barnett, 1995; Campbell et al., 2001). Children included in these studies experienced highly different ECCE structural quality indicators with regard to: adult–child ratio, group size, and teacher qualifications. Magnuson, Meyers, Ruhm, and Waldfogel (2004), using ECLS-K data, found that children who participated in preschool before entering kindergarten had higher reading scores in first and third grade than children who stayed at home. Although they found that these ECCE effects decreased over time, they remained statistically significant in first grade, and a small part of that effect size persisted through third grade (Magnuson, Ruhm, & Waldfogel, 2007b).

The Early Child Care Study (National Institute of Child Health and Human Development Network, 2005) also found that ECCE has a small effect size in third-grade cognitive skills (0.09 *SD*). Children from economically disadvantaged families who participated in ECCE programs outperformed the children not participating on the Woodcock-Johnson. Following these same children up to fifth grade, Dearing, McCartney, and Taylor (2009) explored whether high-quality ECCE programs reduced the association between families' income and poverty rates and the academic achievement of their children. Their findings support the idea that family income plays an important role in academic achievement. Nonetheless, Dearing et al. (2009) also found that this link became increasingly smaller the more time children spent in high-quality ECCE programs. Although it may not be sensible to extrapolate these finding to Chilean ECCE programs, these studies provide a more plausible benchmark than model programs for what we should expect to find for the Chilean context.

Chile's Early Childhood Educational System

Early childhood education in Chile is divided into nursery grades, middle grades, and transition grades. Early nursery is for children ages 3 months to 1 year; late nursery is for 1-year to 2-year-old children. Early middle grade is a service for 2–3-year-old children, and late middle grade to 3–4-year-old children. The transition grade is divided into Pre-K, for children ages 4 and 5 years, and kindergarten for 5 and 6-year olds, of which only the latter is universal and mandatory in Chile.

Currently, more than 37% of children three months to six years attend ECCE programs. However, access is not equally distributed across ages. Only 10% of 1–2-year-old children attend ECCE programs, rising to 41% for 3-year olds and over 80% for 4-year-old children (MIDEPLAN, 2011). Moreover, access is not equally distributed among SES groups. In 2009, almost 53% of high-income families enrolled their children in ECCE programs, while only 32% of children from low-income families attended ECCE programs (MIDEPLAN, 2011). Yearly, Chile spends an average of $3544 per child on early childhood education, compared to the average of $6762 in Organization for Economic Co-operation and Development (OECD) countries, although if the sums are similar in relative terms, approximately 0.5% of GDP (OECD, 2013). Early childhood programs are either publicly or privately funded. Public ECCE programs provide free full-day care and education (8am–5pm). There are two government-funded ECCE programs:

1. Junta Nacional de Jardines Infantiles (JUNJI, National Board of Preschool Programs): dependent on the Ministry of Education, JUNJI offers center-based care and education for children up to four years belonging to low-income families.
2. Integra: Chile's First Lady usually heads this nonprofit foundation, which also depends on the Ministry of Education. Its mission is to provide comprehensive educational development through center-based ECCE services for low-income children ages 3 months to 5 years.

All publicly funded ECCE programs need to comply with national regulations and curricular guidelines outlined in 2011 by the Supreme Decree No. 315. Some requirements for public ECCE are: a 4-year early childhood education degree for teachers, a 2-year technical degree or a high school degree for assistant teachers, adult-to-child ratios of 1:17 for preschool and 1:7 in nursery grades, class sizes of 45 for kindergarten and 20 for nursery grades, and complying with national curricular guidelines, among others.

Chilean studies

Since the 1990s, Chile has substantially increased access to early childhood education for children from low-income families and, at the same time, has tried to improve the quality of those programs (MINEDUC, 2002). The main goals of these efforts have been to reduce educational inequalities and to decrease the achievement gap between poor and wealthier children (Pacheco, Elacqua, & Brunner, 2005). Although early education coverage for children from the low-income group stood at 32.3% in 2009, up from 12.4% in 1990, there has been little research assessing the effects that these programs have had in improving academic outcomes (CEDEP, 2005, 2007).

Chile's Education Quality Measurement System (Sistema de Medición de la Calidad de la Educación, SIMCE), is a national evaluation system managed by the Ministry of Education, that evaluates